

**DISCUSSION PAPER SERIES**

No. 564

**DUALLY-TRADED ITALIAN EQUITIES:  
LONDON VS. MILAN**

Marco Pagano and Ailsa Röell



**Centre for Economic Policy Research**

6 Duke of York Street, London SW1Y 6LA

## **DUALLY-TRADED ITALIAN EQUITIES: LONDON VS. MILAN**

**Marco Pagano and Ailsa Röell**

Discussion Paper No. 564  
July 1991

Centre for Economic Policy Research  
6 Duke of York Street  
London SW1Y 6LA  
Tel: (44 71) 930 2963

This Discussion Paper is issued under the auspices of the Centre's research programme in **Applied Microeconomics**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as a private educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions. Institutional (core) finance for the Centre has been provided through major grants from the Leverhulme Trust, the Esmée Fairbairn Trust, the Baring Foundation, the Bank of England and Citibank; these organizations do not give prior review to the Centre's publications, nor do they necessarily endorse the views expressed therein.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

July 1991

## ABSTRACT

### Dually-Traded Italian Equities: London vs. Milan\*

Italian blue chip stocks are now actively traded in two markets: the dealers' market of SEAQ International in London and the traditional auction market in Milan. Analysing their interaction, we find that:

1. The London market for Italian equities has grown rapidly relative to the Milan stock exchange, but has not reduced trading volume in Milan;
2. Milan prices are generally – but not always – within London quotes;
3. London market makers appear to use price information from Milan to set their quotes, but this informational spillover is rather weak;
4. the growth of the London market for Italian stocks is probably due less to cost factors than to its other characteristics, such as greater depth and immediacy, location and other features typical of dealership markets.

JEL classification: 313

Keywords: competition among stock exchanges, dealership markets, auction markets

Marco Pagano  
Via Catullo 64  
80122 Napoli  
ITALY  
Tel: (39 8) 1552 2411

Ailsa Röell  
Department of Economics  
London School of Economics  
Houghton Street  
LONDON  
WC2A 2AE  
Tel: (44 71) 955 7517

\*We thank Antonio Foglia (Banca del Ceresio), Rony Hamoui (COMIT) and Giovanna Nicodano (Università Bocconi) for their useful comments. A wealth of data and information has been provided by: Marco Bertolini (COMIT); Arnoldo de Giorgio (IMI Securities); Luca Filippa (CONSOB); Giorgio Focas; Paul Henderson (SEAQ International); Mario Mariani (IRS); Fabio Panetta (Banca d'Italia); Pier Luigi Parcu (CONSOB); Alessandro Penati (AKROS Finanziaria S.p.A); Lucia Pierantoni (CONSOB); Giovanni Sabatini (CONSOB); Doris Sew Hoy and Chris Walker (SEAQ International) and Giuseppe Zadra (CONSOB). We are also grateful to Olga Jaramillo, Maria Bianca Magliano, Marina Margheron, Marcella Pagano and Lucia Pierantoni, for their generous help in inputting and organizing data. All errors or inaccuracies, of course, are ours.

Submitted 5 June 1991

## NON-TECHNICAL SUMMARY

In 1985 London's stock exchange created Stock Exchange Automated Quotation (SEAQ) International, a screen-based price-quotation system devoted to trading in the shares of non-UK companies. In the subsequent five years this system has attracted considerable trading volume, especially in the 'blue chip' stocks listed on other European exchanges.

The design of SEAQ International is totally different from that of the auction markets operating in Continental Europe. Bid and ask quotes are set by competitive market makers via a screen-based system: prices are 'quote-driven', rather than 'order-driven' as in auction markets. For each stock, market making is entrusted to a select group of dealers, who must display prices continuously over a prescribed period of the day and must execute incoming orders at the prices displayed, at least within a stated order size.

Owing to the success of SEAQ International, the shares of the major companies from Continental Europe are now traded on the dual system: they can be bought and sold in the auction market of their domestic stock exchange, as well as in the dealership market in London. Italian stocks are no exception to this general pattern. Although the Italian sector of SEAQ International did not operate until 1989, it has grown at an impressive rate, probably spurred by the relative backwardness of the Milan stock exchange.

In fact, the distinctive feature of the Italian case is precisely that the Milan market has so far retained its traditional batch auction system. This contrasts with other European markets such as Paris and Madrid, where the traditional batch auction and open outcry trading have been scrapped in favour of a continuous auction and an automatic order execution system. This paper focuses on the relationship between the London market for Italian equities and the Milan stock exchange: it can thus be regarded as a case study documenting how a dealers' market (London's SEAQ International) competes and interacts with a traditional batch auction market (Milan).

We start by inquiring whether the creation of the London market has led to some cross-border diversion of trade. After a brief description of the growth and current dimensions of the London market for Italian equities, we ask whether it has so far thrived on 'trade diversion' or 'trade creation', i.e. whether it has grown largely at the expense of the Milan stock exchange or has instead stimulated an additional flow of orders (chiefly from international investors). On the whole our findings support the latter conclusion: the Italian sector of SEAQ International has not grown by reducing the volume of trading in Milan. This result must, however, be viewed with caution because of the shortcomings of our volume data on both markets.

Next, we turn to the interaction between the two markets in the determination of prices. We measure their degree of integration by testing for the existence of arbitrage opportunities. Prices in the two markets are generally in line with each other, but their alignment is not perfect: there are instances when the Milan price is outside of the SEAQ 'market touch' in London, i.e. the spread between the best bid and ask prices recorded.

The comparison between the behaviour of prices in the two markets allows us to investigate the direction in which information flows between Milan and London: we try to gauge if bid and ask quotes in London are set on the basis of the prices prevailing in Milan, or rather Milan prices incorporate information earlier reflected in SEAQ prices. For most dually-traded stocks, Milan appears to lead London in the price formation process, meaning that the SEAQ market makers refer to Milan prices to set their quotes; several pieces of evidence indicate, however, that this informational spillover is rather weak, and definitely not as important as for French dually-traded stocks.

Finally, we try to face what is possibly the most important question for future competition between London and Milan: why do so many traders prefer to trade Italian shares in London? We examine several possible answers to this question, analysing the possible influences of transaction costs, market liquidity, geographical externalities and the design of the trading system on the location of Italian equities trading.

Our results show that the total costs of a small round-trip transaction (transaction costs plus bid-ask spread) do not differ greatly in London and Milan. This indicates that the relative cost of transacting is not at the root of the growth of the market for Italian equities in London. The comparative advantage of the London market is probably to be found in a set of factors that are harder to measure: (i) greater depth, i.e. ability to absorb large transactions without large changes in the bid or ask prices; (ii) locational advantage; (iii) greater immediacy due to the continuous nature of the London dealers' market; (iv) other features of dealership that attract some classes of traders, such as the implied insurance against execution risk (a customer knows in advance the prices at which he can trade if he places an order with a dealer) and the possibility of getting greater liquidity by establishing long-term customer relations with a dealer.

## Introduction

In 1985 London's International Stock Exchange (ISE) created SEAQ International, a screen-based price-quotation system devoted to trading in the shares of non-UK companies. In the past five years this system, where quotes are set by competitive dealers, has attracted considerable trading volumes especially in the "blue chip" stocks listed on the other European exchanges. The Italian sector of the market has started to operate as late as 1989, but it has grown at an impressive rate and, according to London dealers, is now also beginning to attract orders by some Italian-based investors. Its rapid growth so far has probably been spurred by the relative backwardness of the Milan stock exchange<sup>1</sup> and also, since October 1990, by the introduction of a capital gains tax in Italy and the uncertainty about its implementation.

This paper focuses on the relationship between the London market for Italian equities and the Milan stock exchange: this topic is of interest not only to assess the current relocation of stock trading in Europe, but also to understand how a dealership market (like London) can operate in parallel with a traditional batch auction market (such as Milan) and interact with it.

---

1 In the Milan Borsa, trade still occurs mainly via batch auctions, except for bilateral trading "in the crowd" before and after the auction: the Borsa thus provides less immediacy than SEAQ International dealers. Moreover, until the end of 1990 stock exchange members were not allowed to trade on their own account. This is in contrast with several other stock exchanges in Continental Europe (such as Paris and Madrid), that have switched to a continuous, computer-supported auction system and have entrusted stock trading to a set of well-capitalized corporate intermediaries who can trade on own account. See Pagano and Röell (1990a).

We start by inquiring whether the creation of the London market has led to some cross-border diversion of trade. After a brief description of the growth and the current dimensions of the London market for Italian equities (section 1), we ask whether so far this market has grown mostly at the expense of the Milan stock exchange or rather has collected an additional flow of orders (mainly from foreign investors) that would not have existed otherwise (section 2).

Next, we turn to the interaction between the two markets in the determination of prices (section 3). We measure their degree of integration by testing for the existence of arbitrage opportunities. Then we investigate the direction in which information flows between Milan and London by looking at the respective price dynamics: we attempt to gauge if bid and ask quotes in London are set on the basis of the prices prevailing in Milan, or rather Milan prices incorporate information earlier reflected in SEAQ prices. As an alternative route to test if Milan prices help SEAQ dealers in setting their quotes, we look at the behaviour of the London bid-ask spread when the Milan stock exchange is closed: if the price information from Italy provides guidance to market makers in London, the bid-ask spread should rise when this information is unavailable. To this purpose, we compare the London spread when Milan is closed with its value when Milan is active -- both within the same trading day, and across different days.

Finally, we try to face what is possibly the most important question for the future competition between London and Milan: why do so many traders prefer to trade Italian shares in London? In the last section of the paper we examine several possible answers to this question, analyzing the possible role that transaction costs, market liquidity, geographical externalities and the design of the trading system may have on the location of Italian equities trading.

## 1. The growth of the Italian equity market in London

The design of the SEAQ International market is totally different from that of the auction markets operating in Continental Europe. Bid and ask quotes are set by competitive market makers via a screen-based system: prices are "quote-driven", rather than "order-driven" as in auction markets. For each stock, market making is entrusted to a selected group of dealers, who must display prices continuously over a prescribed period of the day (the "mandatory quote period"), that generally includes the trading hours of the relevant national exchange. Each market maker is obliged to execute incoming orders at the prices that he has displayed, at least within a stated order size (the "minimum marketable quantity"). A stock can be traded also by dealers who are not market makers (provided they are ISE members): their only obligation is that of providing "best execution" -- offering to their client a price at least as good as the best price currently quoted by the market makers for orders of comparable size.

Initially, SEAQ International has concentrated mainly on the "blue chips" listed in Paris and Frankfurt, the two largest Continental exchanges. Trade in shares listed in Madrid and Milan has begun later -- in 1988 and 1989 respectively. It is generally acknowledged that SEAQ International has been very successful at attracting trading volume in the stocks of these countries. However, comparing the order flow intermediated by SEAQ International to that of the corresponding domestic markets is a rather tricky exercise.

There are two problems. The first is the poor quality of the early data: trade reporting was incomplete until late 1989. The second arises from the intrinsic lack of comparability of trading volume in a dealers' and an auction



market. On SEAQ International, customers' purchases and sales are recorded as separate transactions, and inter-dealer trades are counted once. Thus, if two customers place offsetting orders, these are recorded twice, whereas they would normally be counted as a single transaction in an auction market.<sup>2</sup> Moreover, if the two customers' orders are placed with two different dealers, and these in turn rebalance their inventories by trading with other dealers, these additional transactions are recorded as additional trades -- that are less likely to occur in an auction market, where trades between the two customers need not be channeled through intermediaries. To take into account the double-counting of customer trades, we shall divide SEAQ volume figures by 2. Although this scaling goes in the right direction, it must be stressed that it still does not make SEAQ volume data comparable with those from Milan: this would be the case if SEAQ trading volume consisted only of customer business, whereas it includes also inter-dealer business -- that is on average about 50 % of total SEAQ volume (according to a rough estimate provided by ISE officials).

With these notes of caution, in Table 1 we provide a comparison between trading volume in the Italian sector of SEAQ International and in Milan. In row (1) the volume on SEAQ International (divided by 2) is scaled by the *total* volume in the Milan stock exchange; in row (2), instead, it is scaled by the trading volume in the *same* stocks in Milan. The monthly behaviour of these figures is displayed in Figure 1. To put them in perspective, the lower half of Table 1

-----

<sup>2</sup> The German stock exchanges are an exception to this rule: they count both buy and sell orders as separate transactions.

shows comparable data for the French, German and Spanish sectors of SEAQ International in 1988 and early 1989 (also here SEAQ volumes are divided by 2).

Due to the imperfect comparability of Milan and London volume data, the data in Table 1 and Figure 1 are of interest more for the way they vary over time and across exchanges than for their sheer level. Over time, the size of SEAQ International has had a rapid trend increase relative to the home market, even though the increment may be overstated by underreporting of trades in early 1989. Most of the increases, especially in the bottom line, coincide with the introduction of the shares of "new" companies.<sup>3</sup> The only exception is the sharp acceleration in September and October 1990, when no new companies were introduced. The October increase may be explained by the introduction of a capital gains tax in Italy (October 1), by uncertainty about its implementation, and by a 1-day strike of the Milan stock exchange personnel. However, this interpretation does not accord with the decline of SEAQ trading in November, when these factors should have been at least as effective (there were 4 strike days in that month).

Comparing the figures for Milan with those for the other exchanges, it appears that in 1990 trading volume in the Italian sector of SEAQ International has achieved the same order of magnitude as in the German and French sector in early 1989. This is especially clear if one compares the data reported in rows

-----

<sup>3</sup> Initially, the only companies whose shares were traded on SEAQ International were the Benetton Group, Ferruzzi Finanziaria, FIAT, Generali, Olivetti and STET. Later additions were: Banca Commerciale Italiana, Credito Italiano and Pirelli in May 1989; Montedison and Enimont in July and September 1989 respectively; and IFI, Mediobanca and SIP in June 1990.

Table 1

**Trading volume in the Italian sector of SEAQ International**

*As percent of total volume on the Milan Stock Exchange*

	1989 Jan.-June	1989 June-Dec.	1990 Jan.-June	1990 Jul.-Sep.	1990 Oct.-Dec.
[1]	1.4 %	3.8 %	4.6 %	7.0 %	10.5 %

*As percent of trading volume for the same stocks on the Milan Stock Exchange*

	1989 Jan.-June	1989 June-Dec.	1990 Jan.-June	1990 Jul.-Sep.	1990 Oct.
[2]	6.5 %	11.2 %	16.1 %	18.4 %	30.3 %
(number of companies)	(9)	(10)	(14)	(14)	(14)

**Trading volume in other sectors of SEAQ International\***

*As percentage of total volume in Paris, Frankfurt and Madrid*

	1988	1989 (Jan.-June)
[3] <i>French sector</i>	6.74 %	12.07 %
[4] <i>German sector</i>	6.70 %	8.02 %
[5] <i>Spanish sector</i>	0.04 %	0.80 %

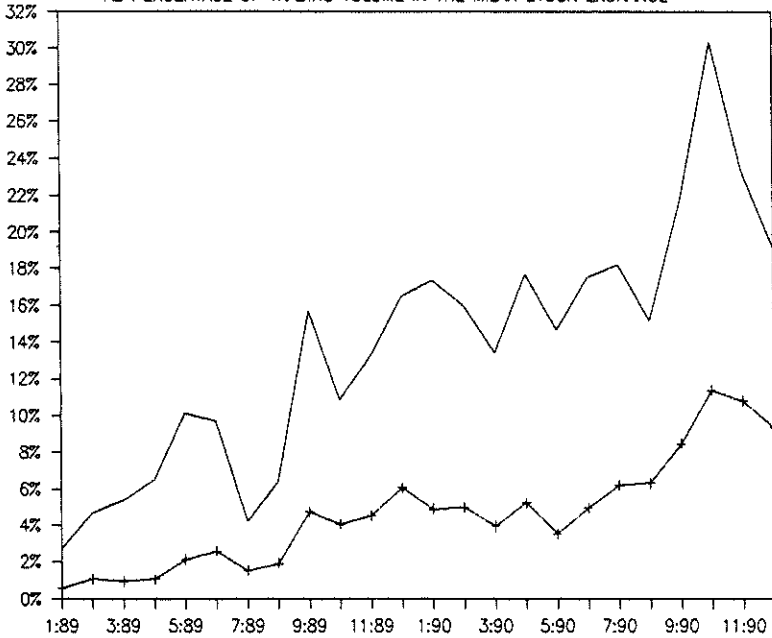
*As percentage of volume for the same stocks in Paris, Frankfurt and Madrid*

	1988	1989 (Jan.-June)
[6] <i>French sector</i> (no. of companies)	13.72 % (24)	25.08 % (29)
[7] <i>German sector</i> (no. of companies)	12.65 % (13)	16.21 % (15)
[8] <i>Spanish sector</i> (no. of companies)	0.53 % (2)	6.15 % (4)

\* All percentages are averages of monthly figures. Figures for Paris refer to the *marché à règlement mensuel*. The number of companies is measured in the last month of the relevant interval. Sources: SEAQ International, Société des Bourses Françaises, Dresdner Bank, AKROS S.p.A., CONSOB and Banco de España.

# TRADING VOLUME IN THE ITALIAN SECTOR OF SEAQ INTERNATIONAL

AS PERCENTAGE OF TRADING VOLUME IN THE MILAN STOCK EXCHANGE



— turnover in the Italian sector of SEAQ International (divided by 2) as % of turnover for the same stocks in the Milan Stock Exchange

+ turnover in the Italian sector of SEAQ International (divided by 2) as % of total turnover in the Milan Stock Exchange

Note: SEAQ International volume figures are divided by 2 because they count purchases and sales by clients as separate transactions (see text).

FIGURE 1

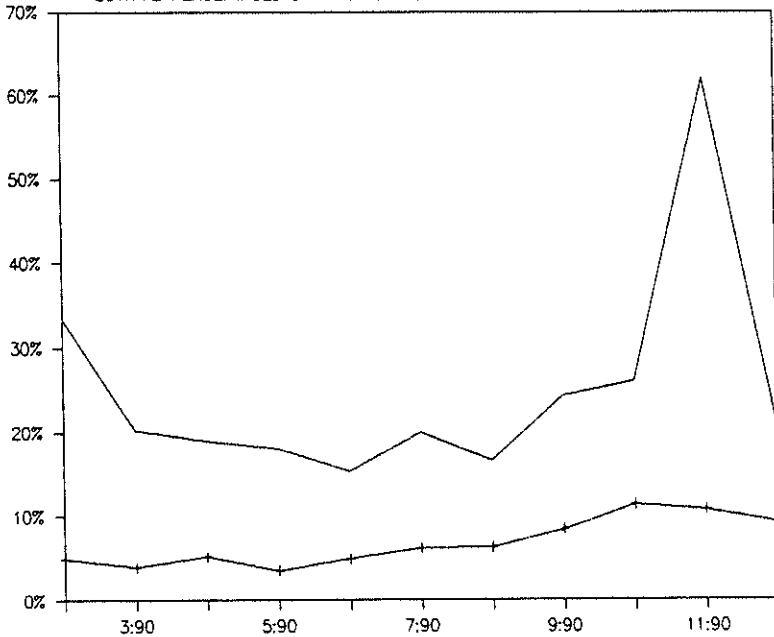
[2], [6] and [7], that are unaffected by differences in the number of companies whose shares are traded in London.

In fact, the London market for Italian shares is even larger than the evidence so far produced indicates. The Monthly Fact Sheet of the Quality of Markets Report (an official publication of the ISE) supplies the total turnover in overseas equities reported by *all* ISE member firms via SEQUAL or CHECKING, the two ISE transaction reporting and trade confirmation systems. These figures are much higher than those referring only to SEAQ International: between February and December 1990 (earlier figures are inaccurate) total trading in Italian shares in London has been on average 3.9 times as large as trading in SEAQ International shares. Figure 2 shows the behaviour of the two series over time, scaling them by the trading volume in Milan (after dividing them by 2; the lower line is the same as in Figure 1, except for its scale). According to ISE officials, the difference between the two series is due, at least partly, to trading of smaller Italian companies not yet quoted on SEAQ: this suggests that stocks can be traded heavily in London well before they appear on the screens of SEAQ International. The total trading volume of Italian equities in London surged tremendously in October and November: the London market as a whole appears to have gained -- much more than SEAQ International alone -- from the strike-induced trading halts in Milan (1 day in October, and 4 days in November).

Despite their shortcomings, the data show clearly that in the last two years the London market for Italian equities has grown rapidly relative to the Milan stock exchange. It is natural then to ask whether -- and to what extent -- this growth has been achieved by siphoning off business from the Italian market: we turn to this question in the next section.

LONDON TRADING IN ITALIAN SHARES:  
TOTAL VOLUME AND SEAQ INTERNATIONAL VOLUME

BOTH AS PERCENTAGES OF TRADING VOLUME IN THE MILAN STOCK EXCHANGE



— trading volume reported by all ISE member firms

+ trading volume on SEAQ International

Note: London volume figures are divided by 2 because they count purchases and sales by clients as separate transactions (see text).

FIGURE 2

## 2. SEAQ International: trade creation or trade diversion ?

Our ability to answer this question is inevitably limited by two facts. First, the true volume of stock trading in Italy is unobservable, because the orders executed off the stock exchange (primarily by banks) are not recorded, although they are estimated to be 2 or 3 times larger than trading on the floor of the Milan exchange. Second, as we have already noticed, before late 1989 the volume data provided by SEAQ International are affected by potentially large errors and underreporting; in addition, the shares of Italian companies have probably been traded in London well before appearing in the list of the SEAQ International securities. However, we must again restrict our attention to what we can measure -- such as the date when an Italian company appeared on the SEAQ screens or the turnover that was reported by SEAQ dealers thereafter. Obviously, in interpreting our results one must consider the inadequacies of the data used.

Our approach is to test if a variable related to trading activity on SEAQ International helps to explain trading volume on the Milan stock exchange for the cross-listed companies. The dependent variable of our regressions is the volume in Milan (number of shares multiplied by price) for the relevant company.

A first set of regressions includes a *SEAQ* dummy among the right-hand side variables: the dummy is 0 before the stock started trading on SEAQ International, and 1 afterwards. We also run a regression where the dependent variable is the total trading volume for all the 12 companies, and the *SEAQ* dummy is replaced by the number of companies traded on SEAQ International at each date. We interpret a negative and significant coefficient on the dummy as a symptom of trade diversion from the Milan stock exchange to SEAQ International. If the

coefficient is insignificantly different from zero, the net loss to the Milan stock exchange is zero. A significant and positive coefficient implies that trade on SEAQ International is actually associated with higher trading in Milan: this is not far-fetched, since SEAQ dealers are known to turn often to the Milan market to rebalance their portfolios, especially when London trading is heavy.

To control for other possible determinants of trading volume, the list of regressors also includes a constant, lagged values of the dependent variable, current and lagged values of total market volume (net of the relevant company's own volume),<sup>4</sup> and current and lagged values of the average return and the volatility of the relevant stock (respectively measured by the monthly average and standard deviation of daily returns).<sup>5</sup> The volatility and average return variables have been introduced because it is well known that trading volume tends to increase when prices become more variable and tends to change asymmetrically, rising more in bull markets than in bear markets (see Karpoff (1987); for theoretical models of these relationships, see also Tauchen and Pitts (1983) and Pagano and Röell (1991)). The choice of lag length has been based on the Schwarz (1978) criterion, and a trend and seasonal dummies have

-----

4 Own volume has been netted out to avoid introducing endogenous variables on the right-hand side of the regressions: otherwise, the current market volume variable would include also the current volume of the company itself (*i.e.* the endogenous variable). The problem would be especially serious for some companies, like Generali and Fiat, whose trading volume is a large fraction of the total turnover on the Milan stock exchange.

5 In the regression for the aggregate volume of all 12 companies, the volatility and the mean returns are the cross-sectional averages of the values of the corresponding variables for the individual companies.



been included in some of the regressions according to the results of F-tests.

The results are displayed in Table 2. The *SEAO* dummy is negative and significant only for FIAT, Montedison, Olivetti and Generali, and for these companies the coefficient is quite large: column [5], that shows the proportional change in volume in the Milan stock exchange associated with the inception of trade on *SEAO* International, indicates that volume in Milan for these companies has fallen between 21 % to 41 % of its mean value. However, for other three companies the dummy's coefficient is positive and significant, and for the rest is small and not significantly different from zero. The net aggregate result, shown in the last row, is that so far volume in the Milan stock exchange has not been significantly affected by the operation of the *SEAO* International market.

These results are strengthened by those of another set of regressions (not reported for brevity), where the *SEAO* dummy has been replaced with data for trading volume on *SEAO* International (for each company separately and for the their aggregate volume). Here only Montedison and Generali have negative and significant coefficients on *SEAO* volume, STET and IFI have positive and significant coefficients. In all the other regressions, including that for aggregate volume, the coefficient is not significantly different from zero.

Thus the results point to the conclusion that no trade diversion from the Milan stock exchange has been associated with trading of Italian shares on *SEAO* International, with the significant exceptions of Montedison, Generali and per-

Table 2

The impact of SEAQ International on trading volume in the Milan stock exchange<sup>a</sup>

[1]	[2]	[3]	[4]	[5]	[6]	[7]
<i>Company</i>	<i>Sample period</i>	<i>SEAQ dummy</i>	<i>mean of dependent variable</i>	<i>(3)/(4)</i>	<i>number of lags, trend, seasonal dummies included</i>	<i>R<sup>2</sup></i>
CREDIT	82:10-90:10	11,814** (3.03)	19,842	0.59	1 lag	0.77
COMIT	83:9-90:10	42,685** (1.93)	48,850	0.87	12 lags trend	0.90
IFI	82:10-90:10	7,240 (0.76)	50,120	0.14	1 lag	0.82
FIAT	82:10-90:10	-78,183** (-2.27)	313,313	-0.24	1 lag	0.88
MONTEDISON	82:10-90:10	-76,026** (-2.22)	184,133	-0.41	1 lag	0.72
OLIVETTI	82:10-90:10	-36,640** (-2.02)	101,678	-0.34	1 lag trend	0.74
BENETTON	86:9-90:10	414 (0.13)	20,146	0.02	1 lag	0.44
GENERALI	82:8-90:10	-71,778** (-2.55)	233,913	-0.31	5 lags seasonal dummies	0.94
MEDIOBANCA	82:4-90:10	-12,427 (-0.82)	73,920	-0.17	1 lag	0.80
SIP	82:4-90:10	5,202 (0.80)	27,684	0.19	1 lag trend	0.81
STET	82:4-90:10	9,669** (1.74)	36,091	0.27	1 lag trend	0.86
PIRELLI	82:4-90:10	-2,257 (-0.45)	30,637	-0.07	1 lag	0.76
ALL	82:11-90:10	10.180 (0.74)	1,544,945	0.01	1 lag	0.53

<sup>a</sup> Data have monthly frequency. The dependent variable is the volume (number of shares traded multiplied by price) for the relevant company in the Milan stock exchange. For the list of regressors, see the text. The estimation method is OLS, and the numbers in parenthesis are t-statistics. Regressions for Enimont and Ferruzzi Finanziaria have not been estimated because of the small size of the relevant sample.

haps FIAT and Olivetti. However, it must be recalled that our results can be vitiated by the fact that both our SEAQ dummy and our SEAQ volume data are at best imperfectly correlated with the trading volume in London on the relevant shares: actual trading by London dealers can start well in advance of formal SEAQ trading, and volume was severely misreported on SEAQ International in 1989. In other words, we cannot rule out that if our data were more accurate we would conclude that trade diversion has occurred for a larger number of companies.

It should also be remembered that much stock trading that goes on in Italy never surfaces in the Milan stock exchange. Thus, even if our evidence says that on balance SEAQ International has not diverted trade away from the Milan exchange, it is possible that part of the order flow formerly channeled into the off-exchange trading system found its way to London. Unfortunately, the data to test this hypothesis do not exist.

### **3. The links between the two markets: arbitrage and information flows between Milan and London**

How closely integrated are these two markets? The most basic measure of segmentation in this context is the existence of arbitrage opportunities, since exchange rate risk is absent (SEAQ International prices are quoted in home currency). We have collected a continuous record of quotes from the Italian sector

of SEAQ International and of transaction prices from the Milan stock exchange between October 25 and November 7, 1990. The SEAQ data contain the highest bid and lowest ask prices quoted at each given instant in the London market. The Milan data record the prices struck throughout the day, with their respective times, and fall in three classes: prices set in the daily batch auction, that takes place at a different time for each stock (*chiusura*), prices set before this auction (*avanti listino*) and after it (*dopo listino*). The *avanti listino* and *dopo listino* prices are set in the context of bilateral trades "in the crowd" and immediately flashed on a screen that is visible to all floor traders. The time labels of our Milan prices correspond to the moment when they were reported in this fashion to market participants. As a result, the time-matching of our data from London and Milan reproduces the set of prices actually faced by traders who had simultaneous access to the two markets in the sample period.

Our results (shown in Table 3) suggest that the two markets are not instantaneously arbitrated: in a considerable proportion of cases the Milan price lies outside the spread between the best bid and offer prices recorded on SEAQ International -- the so-called "market touch". In these cases, one of the parties involved in a Milan trade could have obtained a better price in London. Before and after the batch auction, price misalignments are present in about 10 % of the observations (the average for all the stocks is 9.8 % for the *avanti listino* trades and 11.5 % for the *dopo listino* ones). Their frequency is about double for the batch auction (21.5 %), but this estimate may not be very reliable, because for auction prices we had very few data points.

Visual inspection of the data suggests that these misalignments of London and Milan prices are usually rectified by changes in the SEAQ quotes within a matter

Table 3

Arbitrage opportunities: proportion of Milan prices outside the contemporaneous "best bid-offer" interval recorded on SEAQ International<sup>a</sup>

[1]	[2]	[3]	[4]	[5]
<i>Company</i>	<i>"Avanti Listino" (bilateral trades before batch auction)</i>	<i>"Chiusura" (batch auction)</i>	<i>"Dopo Listino" (bilateral trades after batch auction)</i>	<i>Number of observations</i>
CREDIT	16 %	0 %	5 %	112
COMIT	25 %	80 %	20 %	196
IFI	— <sup>b</sup>	17 %	2 %	103
FIAT	0 %	0 %	20 %	332
MONTEDISON	0 %	50 %	9 %	162
OLIVETTI	23 %	40 %	38 %	189
BENETTON	26 %	33 %	5 %	48
GENERALI	1 %	0 %	0 %	170
MEDIOBANCA	4 %	0 %	9 %	162
SIP	7 %	0 %	0 %	52
STET	4 %	67 %	23 %	88
PIRELLI	— <sup>b</sup>	0 %	14 %	86
ENIMONT	0 %	14 %	17 %	117
FERRUZZI	— <sup>b</sup>	0 %	0 %	9

<sup>a</sup> Based on a continuous record of SEAQ International quotes and Milan transaction prices reported on 25, 26, 29, 30, 31 October and 2, 5, 6, 7 November 1990. The data have been provided respectively by The International Stock Exchange (ISE) and by the Commissione Nazionale per le Società e la Borsa (CONSOB).

<sup>b</sup> No transaction prices from Milan available in the data set.

# COMIT: MILAN PRICES AND LONDON QUOTES

(OCTOBER 25 AND 26, 1990)

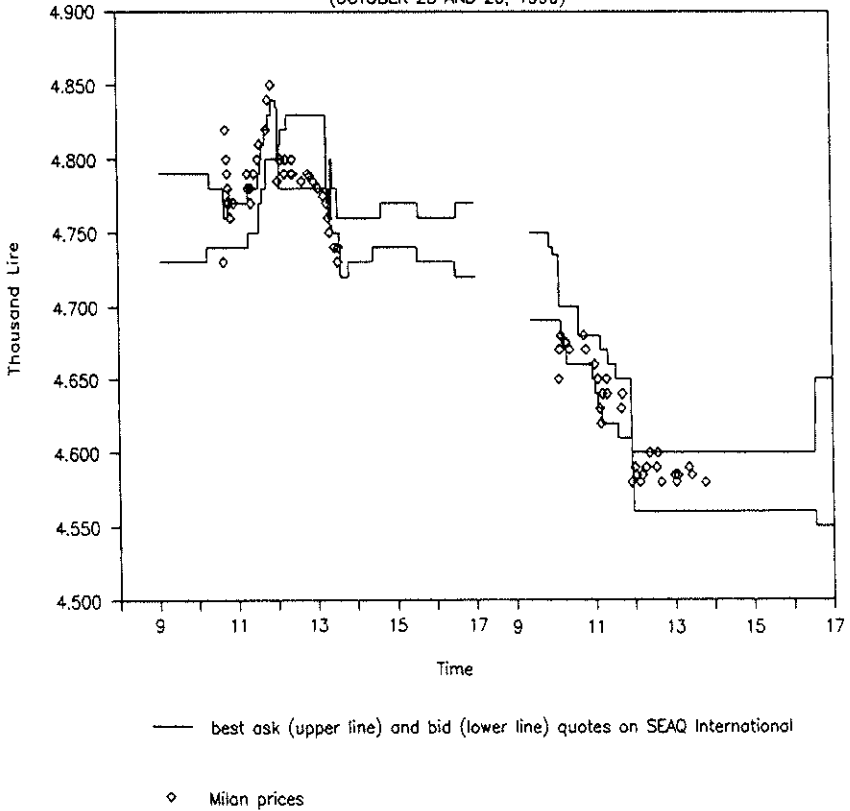
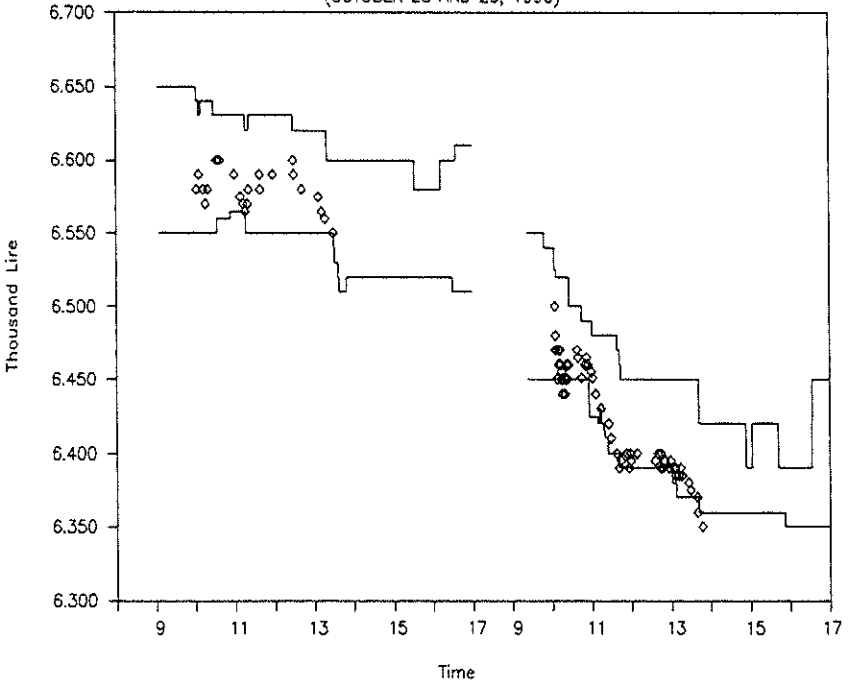


FIGURE 3

# FIAT: MILAN PRICES AND LONDON QUOTES

(OCTOBER 25 AND 26, 1990)



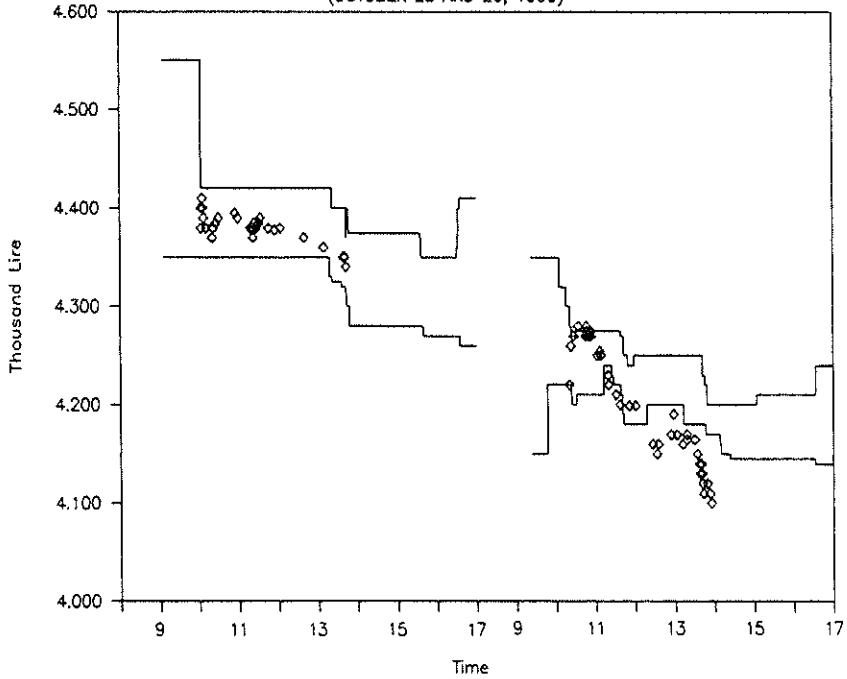
— best ask (upper line) and bid (lower line) quotes on SEAQ International

◇ Milan prices

FIGURE 4

# OLIVETTI: MILAN PRICES AND LONDON QUOTES

(OCTOBER 25 AND 26, 1990)



— best ask (upper line) and bid (lower line) quotes on SEAQ International

◇ Milan prices

FIGURE 5



of minutes, although in some cases the discrepancy is far more persistent. The time pattern of the two market prices is illustrated by figures 3, 4 and 5, that respectively refer to the COMIT, FIAT and Olivetti stocks in the first 2 trading days of our sample (October 25 and 26, between 8 a.m. and 5 p.m.): the solid lines show the best bid and ask prices quoted by SEAQ market makers, whereas the symbols indicate the prices struck in the Milan stock exchange.

The occasional misalignments between Milan prices and London quotes contrast with the result reported by Pagano and Röell (1990b) for the Paris Bourse, where minute-by-minute price data reveal total absence of arbitrage opportunities with the French sector of SEAQ International. This is probably related to the continuous nature of the Paris auction system, and particularly to the fact that its automatic order execution system disseminates real-time information on the state of the limit order book, in France as well as in London: at each instant all market participants observe the limit prices at which an incoming market order will be executed. In contrast, Milan prices, though reported immediately to the market, are *ex post* transaction prices -- not limit order book quotes, signalling a willingness to trade at that price. In other words, an arbitrageur may be unable to exploit the misalignment between the Milan and SEAQ prices, as the latest Milan price may not be a reliable indicator of the price at which he may actually trade if he attempts to close an arbitrage.<sup>6</sup>

---

<sup>6</sup> In addition, at times other than the batch auction, it may be difficult to close an arbitrage between London and Milan because of the different magnitude of the orders usually executed in the two markets: the deals involved in the bilateral trading activity in Milan (the so-called *durante*) are much smaller, on

Another dimension of the integration between two speculative markets for the same security is the direction of information flows between them, as reflected in the process of price formation on each of them. We consider whether there is a sense in which one of the two markets is ahead of the other. Garbade and Silber (1979) described such a situation as a "dominant-satellite" relationship.

To test for the existence of this relationship between the two markets, we have estimated by OLS the following equations (on the same data set used for the arbitrage tests):

$$(1) \quad P_{t+1} - P_t = \alpha + \beta (Q_t - P_t)$$

$$(2) \quad Q_{t+1} - Q_t = \gamma + \delta (P_t - Q_t)$$

where  $P_t$  is the price recorded at time  $t$  at the time of the  $t$ -th transaction in Milan and  $Q_t$  is the mid-price (the average of the bid and the ask prices) contemporaneously quoted on SEAQ International. If London is ahead of Milan (meaning that SEAQ quotes incorporate information over and above Milan prices), then the estimated value of  $\beta$  should be positive and significant. If instead Milan is ahead of London,  $\delta$  should be positive and significant.

-----

average, than those effected by SEAQ International dealers. As far as we know, these are the only reasons why prices between the two markets may be out of line. We can in fact rule out that the capital gains tax may have created a wedge between the two markets, since Italian investment funds are exempt from it and would arbitrage it away; neither can the misalignment derive from different settlement times for the two markets, because also SEAQ trades appear to be

Table 4

## Lead-lag relationship between London quotes and Milan prices

[1]	[2]	[3]
<i>Company</i>	$\beta$	$\delta$
CREDIT	0.146 (1.18)	0.418 (3.80)
COMIT	0.254 (3.70)	0.149 (3.74)
IFI	0.091 (0.81)	0.095 (0.93)
FIAT	0.016 (0.52)	0.115 (4.09)
MONTEDISON	-0.038 (-0.80)	0.191 (5.82)
OLIVETTI	0.060 (1.12)	0.092 (2.24)
BENETTON	0.176 (0.88)	0.334 (2.38)
GENERALI	0.315 (2.64)	0.083 (0.77)
MEDIOBANCA	0.151 (2.03)	0.158 (2.91)
SIP	0.795 (3.10)	-0.084 (-0.50)
STET	0.100 (1.19)	0.207 (3.49)
PIRELLI	-0.023 (-0.23)	0.207 (2.60)
ENIMONT	-0.108 (-0.98)	0.246 (2.27)

<sup>a</sup> The data are the same used in Table 3 (the number of observations is that reported in column [5] of that table *minus* one). The estimation method is OLS, and the numbers reported in parenthesis are t-statistics. A significant estimate of  $\beta$  indicates that the London mid-quote price leads the Milan price; a significant estimate of  $\delta$  indicates that the reverse is true.

Our results (reported in Table 4) show that, in most cases, Milan seems to lead London. The estimated value of  $\delta$  is positive and significant at the 5 % confidence level for 9 stocks out of 14, and it is always larger than the estimated value of  $\beta$ . The estimates of  $\beta$ , instead, are positive and significant for 4 stocks; for 2 of these (COMIT and Mediobanca) also  $\delta$  is significant, indicating that there is a mutual feedback over time between prices in the two markets. Thus, information seems to flow mostly from Milan to London, although in some cases SEAQ prices are significant predictors of Milan price changes. The latter is a surprising finding, since one would expect all the fundamental information concerning these stocks to be generated in Italy: a possible explanation is the presence of large Italian players' branch offices in London.<sup>7</sup>

An alternative method to gauge the direction of information flows between the two markets is to look at the behaviour of the market touch in London when the Milan stock exchange is closed. If the information reflected in Milan prices helps SEAQ dealers in setting their quotes, the market touch in London should rise when this information becomes unavailable, *i.e.* when the Milan exchange is closed. Two independent pieces of evidence are available on this point.

-----  
settled at the date set by the Milan stock exchange.

<sup>7</sup> The approach used in this test is susceptible of several refinements, that we plan to implement in the future. One is to use a model richer than that of equations (1) and (2) to model the dynamic interactions between the two markets. Another is to adopt a methodology that takes explicitly into account the uneven frequency at which our observations are recorded, and the effects of rounding errors.

First, one can look at the size of the market touch in London at *different times of the day*, comparing its value outside the trading hours of Milan with its value during those hours. The Milan stock exchange opens at 10.00 a.m.,<sup>8</sup> while its closing time differs from day to day depending on trading volume -- currently, it closes around 2.00 p.m. on a normal trading day. Using our minute-by-minute data (see footnote to Table 3), we have found that the average market touch in London has a shallow U-shaped intradaily pattern: it starts from 1.75 % at 10.30 a.m., decreases to 1.53 % at 12.00, then climbs to 1.62 % at 1.30 p.m. and reaches its maximum after Milan closes, being 1.86 at 3.00 p.m. and 1.81 at 4.30 p.m.. This slight increase after the Milan close accords with the idea that Milan prices help dealers in setting their quotes in the Italian sector. But the increase is small if compared with that recorded for French cross-listed stocks, where the SEAQ touch roughly doubles after Paris closes (see Pagano and Röell, 1990b): thus price information from Paris increases the liquidity of the London market much more than price information from Milan.

The second piece of evidence was generated by the closure of Italian stock exchanges on October 18, November 16, 19, 20 and 21, 1990, due to the strikes of the "procuratori di Borsa" (floor traders employed by stock exchange member firms). This episode allows us to compare the market touch in London *across days* of trade and no-trade in Milan -- *i.e.* no-strike and strike days respectively. Our data refer to the market touch at (or just before) 4.30 p.m. be-

---

<sup>8</sup> Italian time (also in what follows).

Table 5  
Spreads and strikes

[1]	[2]	[3]	[4]	[5]
<i>Company</i>	<i>SEAQ "touch" when Milan is open (average, Sept.-Dec. 1990)</i>	<i>SEAQ "touch" when Milan is closed (average same period, strike days<sup>a</sup>)</i>	<i>T-stat. for the difference between the two means:<sup>b</sup> [3]-[2]</i>	<i>Degrees of freedom<sup>c</sup></i>
BENETTON	2.22 %	1.32 %	-5.19**	24
COMIT	1.16 %	1.05 %	-0.81	6
CREDIT	1.94 %	1.28 %	-2.28*	7
ENIMONT	2.29 %	2.18 %	-0.13	1
FERRUZZI	3.95 %	2.27 %	-2.86	2
FIAT	1.01 %	0.69 %	-3.17**	9
GENERALI	0.95 %	0.71 %	-2.11*	8
IFI	2.52 %	2.15 %	-1.19	6
MEDIOBANCA	1.79 %	1.58 %	-1.81**	43
OLIVETTI	2.12 %	1.85 %	-1.42	7
PIRELLI	2.87 %	2.60 %	-0.81	7
SIP	1.52 %	1.27 %	-1.80*	28
STET	1.33 %	1.01 %	-1.50*	6
ALL	1.97 %	1.48 %	-4.61**	78

<sup>a</sup> Strike days: October 18, November 16, 19, 20 and 21.

<sup>b</sup> One asterisk indicates that the difference between the two means is different from zero at the 10 % significance level; two asterisks indicate that it is different from zero at the 5 % level.

<sup>c</sup> Calculated as: 
$$\frac{(s_1^2/n_1 + s_2^2/n_2)^2}{\frac{(s_1^2/n_1)^2}{n_1 + 1} + \frac{(s_2^2/n_2)^2}{n_2 + 1}} - 2$$
, approximated to the nearest integer.

tween September 1st and December 31st, 1990.

Surprisingly, it turns out that when the Milan stock exchange was closed the market touch in London was either *significantly lower or insignificantly different* from its mean value in the rest of the period (see Table 5). For all the stocks, in fact, the touch was lower than in "no-strike" days. Moreover, when the T-test is repeated by pooling *all* the data (bottom row in the table), one finds that the average London bid-ask spread is *significantly lower* when Milan is not operating. This result is rather puzzling, although there are ways in which it can be rationalized.<sup>9</sup> As far as the informational spillovers from Milan to London, however, its meaning is clear: price information from Milan is not of crucial importance to SEAQ International market makers.

To summarize, our results on the informational flows between London and Milan are rather mixed. The regression evidence on leads and lags in price setting point to a leading role for Milan, although they do not rule out that SEAQ In-

-----

<sup>9</sup> One possible solution to the puzzle is that when Milan is closed SEAQ market makers are less vulnerable to opportunistic short-term traders, who monitor discrepancies between Milan and London prices and take advantage of them: during the strike days, this type of riskless arbitrage could not be performed. Another explanation is that, when the Milan market closed, SEAQ market makers cannot lay off their inventories in the Italian market or cover there their short positions. They may therefore need to control their inventories more carefully and to offer particularly good deals to traders willing to take on their long or short positions. A third explanation is that, with Milan closed, more Italian-based "liquidity traders" are forced to trade in London, and the increased market depth allows market makers to tighten their bid-ask spreads. But this explanation is at odds with the fact that SEAQ trading volume in Italian equities actually *fell* during the "strike days" (during these days the average number of shares traded was 4,780,085, against a value of 10,557,722 shares per day in the rest of October and November) -- possibly a reflection of the diminished arbitrage activity between the two markets.

ternational may actually be ahead of Milan for some stocks (4 out of 14). The intradaily behaviour of the SEAQ market touch in London is consistent with a weak informational spillover from Milan to London. However, these two findings conflict with the evidence from the "strike days" data, that points to no such informational spillover. On balance, it seems fair to say that, although one cannot rule out that price information from Milan helps quote-setting by SEAQ market makers, the informational spillover is rather tenuous, and certainly much weaker than that originated by the Paris Bourse.

#### **4. Why do some investors prefer to trade Italian shares in London ?**

There are three classes of reasons why security traders may be attracted to one marketplace rather than to another: (i) low transaction costs and high market liquidity; (ii) external economies from location; (iii) other features of the trading system that are not captured by measures of transaction costs and of market liquidity, such as the immediacy provided by the market. In this section



we evaluate how each of these three types of motivations might affect the location of Italian equity trading between London and Milan.

#### **4.1. Transaction costs and liquidity**

From the viewpoint of a trader, high transaction costs and low market liquidity are largely equivalent -- they both create a wedge between the sum one pays to buy and sell a security. Nevertheless, the two terms generally denote distinct notions: the liquidity of a market depends on the way prices are formed and assets are traded, whereas transaction costs don't. Typically, transaction costs arise from taxes and commissions; illiquidity is measured instead by the bid-ask spread. This is not to say that only dealers' markets can be illiquid: an "implicit bid-ask spread" also exists in auction markets, where no dealers quote bid and ask prices. In an auction too, the price at which a given amount of a security can be bought generally exceeds the price at which it can be sold, due to the "price pressure" effect of the order flow: buy orders tend to raise prices, and sell orders tend to lower it. The illiquidity of an auction market depends on the size of this adverse price response to the order flow, just like that of a dealers' market depends on the size of the bid-ask spread.

In the Milan stock exchange, transaction costs stem mainly from commissions: the highest commission rate for ordinary (non-bank) clients is 1.4 %. Adding stamp duty, one gets a maximum round-trip transaction cost of 1.5 % for ordinary clients. Institutional investors that trade frequently on the Italian market generally secure better terms: their round-trip costs can be estimated to be around 1 % of the value of the transaction.

As for the "implicit bid-ask spread" of the Milan market, we measure it from

our minute-by minute transaction prices using the technique proposed by Roll (1984), that is based on the first-order autocovariance of returns. Our estimates are shown in column [2] of Table 6: where it can be calculated, Roll's measure is small -- with an average of 0.3 %, and its highest value at 0.7 % (Benetton). It should be noticed that this measure of the implicit spread is appropriate if the spread arises only from the order-processing costs of intermediaries. In fact, the bid-ask spread arises also from other factors, such as adverse selection (it compensates intermediaries for bearing losses inflicted by insider traders) and inventory holding costs (it must reward them for the riskiness of their inventories). Thus, our estimates based on Roll's method are probably a downward biased measure of the illiquidity of the Milan market.

In the London market, the distinction between transaction costs and bid-ask spreads is blurred because often dealers substitute lower commissions with higher spreads. For about 50 % of the orders executed on SEAQ International, the customer is not charged commissions: bid and ask prices are quoted "net" of commission charges. Since in the U.K. foreign equities are exempt from stamp duty, for these deals transaction costs are zero, and the bid-ask spread is the only cost incurred in a round-trip transaction.

In our minute-by-minute data (recorded between October 25 and November 7), the market touch on SEAQ International averages 1.7 %.<sup>10</sup> In column [3] of Table

-----

<sup>10</sup> In the first semester of 1990 the market touch in the Italian sector of SEAQ International has been on average 1.1 %, according to the tables reported in CONSOB (1990), that are in turn based on SEAQ closing prices (around 4.30 p.m., Italian time). The comparable average for October and November is 2 % (based on

Table 6

The "implicit bid-ask spread" in Milan and the bid-ask spread in London

---

[1]	[2]	[3]
<i>Company</i>	<i>Roll's measure of the "implicit bid-ask spread" in Milan <sup>a</sup></i>	<i>Bid-ask spread (average value of the market touch) in the Italian sector of SEAQ International <sup>b</sup></i>
BENETTON	0.70 %	1.21 %
COMIT	0.39 %	0.90 %
CREDIT	— <sup>c</sup>	1.42 %
ENIMONT	— <sup>c</sup>	3.10 %
FERRUZZI	— <sup>d</sup>	3.84 %
FIAT	0.10 %	0.93 %
MONTEDISON	0.09 %	1.98 %
GENERALI	0.16 %	0.85 %
IFI	0.28 %	2.38 %
MEDIOBANCA	0.33 %	1.30 %
OLIVETTI	0.17 %	1.46 %
PIRELLI	— <sup>c</sup>	2.44 %
SIP	0.60 %	1.14 %
STET	0.28 %	1.45 %

---

<sup>a</sup> The measure of the implicit bid-ask spread proposed by Roll (1984) is:

$$s = 200 [-\text{cov}(r_t, r_{t-1})]^{1/2} ,$$

where  $r_t$  is the percentage return on the stock between time  $t-1$  and time  $t$ .

<sup>b</sup> The observations used to compute this average are exactly time-matched with the corresponding Milan prices used in column [2].

<sup>c</sup> The  $\text{cov}(r_t, r_{t-1})$  term is positive, so that  $s$  cannot be calculated.

<sup>d</sup> Not enough observations.

6, we report for each stock the average touch at the same times when the transaction prices used in column [2] were recorded in Milan (to ensure comparability between the two columns).

Can we say, on the basis of these estimates, if the overall cost of transacting -- transaction costs *plus* bid-ask spread -- is lower in London or Milan ? The answer depends on the commissions charged to our hypothetical trader in the two markets. If we consider the scenario most favourable to the London market, by assuming that round-trip transaction costs in Milan are 1.5 % and that no commissions are charged in London, then SEAQ International is cheaper than Milan for most stocks. Taking the more symmetrical case of an investor who can get good terms on both markets (*i.e.* pays a 1 % round-trip transaction cost in Milan and no commissions in London), the picture appears more balanced. Adding the 1 % transaction cost for Milan to the figures in column [2] and comparing the result to the numbers in column [3], one finds that for a core of high volume stocks the two markets are roughly on equal grounds (within 0.2 % from each other: the stocks are FIAT, Generali, Mediobanca, Olivetti, STET). For the others, one of the two markets has a competitive advantage on the other.

For institutional investors, however, the London market may present an additional advantage that does not appear from our data: market *depth*, *i.e.* the

-----

data drawn from the financial newspaper "Il Sole 24 Ore"), probably reflecting the greater volatility of stock prices due to Gulf crisis. Anyway, these values of the touch are in the same range as the 1.5 % value computed for the French sector of SEAQ International (June-July 1989) by Pagano and Röell (1990b).

ability to absorb large orders with little adverse effect on transaction prices. In fact, our previous comparison does not take into account that SEAQ quotes are meant for large deals (the average bargain size being about 200 million Lire), whereas our "implicit bid-ask spread" in Milan is estimated from prices referring mainly to small transactions. For large orders the competitive advantage of the London market is likely to be greater than our figures suggest.

#### 4.2. External economies from location

A second class of reasons are clearly linked to the location of the market. London is the most active financial marketplace in Europe, and its high concentration of institutional investors tends to confer a comparative advantage to its security markets relative to their Continental competitors. For non-Italian institutional investors it is natural to buy and sell Italian shares from SEAQ dealers with whom they also trade most other European securities and often have established customer relationships. These investors could be attracted to Milan only if this market offered much lower transaction costs or much greater liquidity.

#### 4.3. Design of the trading system

A third set of motives for preferring SEAQ International to Milan has to do with the differences in the design of the two trading systems. One advantage of the London market is the **continuity** of trading: price information is continuously available from SEAQ screens, and even large orders can be quickly and efficiently executed on the phone, also in the afternoon hours. This can push traders who need great immediacy for their transactions to prefer London to Milan. How-

ever, the London trading system also has one disadvantage: **settlement**, that is performed in Milan, generally ends up being more expensive relative to orders executed in Italy.

An additional difference in the design of the trading mechanism is that SEAQ International is a dealership market, while Milan is an auction market. The specific features of these two trading mechanisms may induce some traders to prefer a dealers' market and others to prefer an auction market, other things being equal. The experience of SEAQ International shows that the two classes of traders differ primarily by size: the "wholesale" segment of the clientele, mainly formed by institutional investors, appears to prefer a dealership market, even when a highly efficient auction market would be available, as in the French case; the latter ends up catering to the "retail" segment, mainly formed by the private domestic customers.

One of the key characteristics of a dealership market is that it offers **insurance against execution risk**: a customer knows in advance the prices at which he can trade if he places an order with a dealer. This is not the case in an auction market like that of Milan: if a customer places a market order, he is not sure of the price at which his order will execute; if he places a limit order, he risks that the order may not be executed. In Pagano and Röell (1990c), we provide a simple model of execution risk where it turns out that the more risk averse a customer, the more likely she is to prefer the dealer market (assuming that the dealers have the same risk aversion as the speculators who participate in the auction market). Thus, if an auction and a dealer market are running in parallel, like SEAQ International and Milan, one would expect the more risk averse customers to migrate to the dealership market.<sup>11</sup>

Another feature that differentiates a dealer's market from an auction system is the **visibility of orders**. It is often suggested (Admati and Pfleiderer 1990, Gennotte and Leland 1990) that uninformed traders could obtain greater liquidity if they were able to credibly announce their orders. The first issue here is obviously whether they can convince the market that they are truly uninformed. Suppose that this problem is resolved at least for some types of traders, for example by pre-announcements far enough in advance of the actual trade. Still, a second issue remains unsolved in a batch auction:<sup>12</sup> there is an incentive to overstate the quantity to be traded, so that many offsetting orders are attracted into the market. The greater the amount of offsetting orders that a trader can attract into the market via his announcement, the better the price he obtains. However, other traders will anticipate this incentive to overstate the quantity, and will not pay attention to the size of the announced trade.

-----

11 We are again assuming that the dealers' risk aversion equals that of the auction's speculators. This prediction is reinforced if dealers are less risk averse than the auction's speculators (and could be reversed in the opposite case).

12 This is not true of a continuous auction system such as that operating in Paris, where each order can be identified by referring to the moment in which it has been transmitted to the market. Indeed, in that system, orders have even *greater* visibility than in a dealership market, since all market participants can observe them. Even then, however, an uninformed customer may prefer trading with a dealer rather than in the auction market: convincing a single dealer of one's innocence may be much easier than convincing the entire market.

In a dealership market, instead, orders are directly observed by the dealer. Hence, orders of demonstrably innocent traders can be filled at better terms than in a competing batch auction -- indeed, they can be filled at zero adverse selection costs. The loss of these orders will also reduce the liquidity of the competing auction market, as in the Röell (1991) "dual capacity" model.

This line of argument can also explain why institutional traders concentrate in dealership markets such as SEAQ International and private clients on the corresponding auction markets: large investors may prove their innocence more easily than small traders. There are two possible reasons for this. First, there may be a fixed cost of verification, so that it is not worthwhile for small customers to assert their innocence. Secondly, it is the large institutions who tend to be repeat customers, so that they have a visible trading history that can be used to acquire a reputation for trustworthy behaviour. For the same reason, they stand to gain more from establishing such a reputation.

## 5. Conclusion

This paper has analyzed the growth of the London market for Italian stocks and its relationship with the domestic market for the same stocks in Milan. The coexistence of a dealership market in London and an auction market in Continen-



tal Europe is not a unique feature of Italian equities: by now, most "blue chip" stocks listed in Continental exchanges are traded also in London. The distinctive feature of the Italian case is that the Milan market has so far retained its traditional batch auction system: this contrasts with other European markets, such as Paris and Madrid, where this system has been deeply changed (see Pagano and Röeli, 1990a). The analysis in this paper can thus be regarded as a case study documenting how a dealers' market (London's SEAQ International) competes and interacts with a traditional batch auction market (Milan).

To summarize our main results, we have found that:

1. the London market for Italian equities has grown rapidly over time relative to the Milan stock exchange, but its growth has not taken place by taking away trading volume from Milan (although this conclusion must be taken with caution in view of the shortcomings of our volume data from both markets);
2. prices in the two markets are generally in line with each other, but the alignment is not perfect: there are instances when the Milan price is outside of the market touch in London;
3. for most dually-traded stocks, Milan appears to lead London in the price formation process, meaning that SEAQ market makers refer to Milan prices to set their quotes; however, several pieces of evidence indicate that this informational spillover is rather weak, and definitely not as important as it is for French dually-traded stocks;
4. since the total costs of a *small* round-trip transaction (transaction costs plus bid-ask spread) do not differ greatly in London and Milan, they cannot be at the root of the growth of the market for Italian equities in London;
5. the factors behind the growth of this market are probably just those that are

harder to measure: (i) greater depth, *i.e.* the ability to absorb *large* transactions without large changes in the bid or the ask prices; (ii) the locational advantage of London; (iii) the greater immediacy due to the continuous nature of London dealers' market; (iv) other features of dealership that attract some classes of traders, such as the implied insurance against execution risk and the possibility of getting greater liquidity by establishing long-term customer relations with a dealer.

## References

- Admati, A. R. and P. Pfleiderer (1988), "A Theory of Intraday Patterns: Volume and Price Variability," *The Review of Financial Studies*, Vol. 1, No. 1, Spring, 3-40.
- CONSOB - Commissione Nazionale per le Società e la Borsa (1990), "Relazione sui titoli italiani trattati al SEAQ International," Area Borsa, Ufficio Andamento Titoli, August 21.
- Garbade, K. D. and W. L. Silber (1979), "Dominant and Satellite Markets: A Study of Dually-traded Securities," *The Review of Economics and Statistics*, Vol. 61, August, 455-462.
- Gennotte, G. and H. Leland (1990), "Market Liquidity, Hedging and Crashes," *American Economic Review*, Vol. 80, No. 5, December, 999-1021.
- Karpoff, J. (1987), "The Relationship between Price Changes and Trading Volume: A Survey," *Journal of Financial and Quantitative Analysis*, Vol. 22, 109-126.
- Pagano, M. and A. Röell (1990a), "Trading Systems in European Stock Exchanges: Current Performance and Policy Options", *Economic Policy*, Vol. 10, April, 65-115.
- Pagano, M. and A. Röell (1990b), "Shifting Gears: An Economic Evaluation of the Reform of the Paris Bourse," LSE Financial Markets Group Discussion Paper No. 103, October.
- Pagano, M. and A. Röell (1990c), "Auction Markets, Dealership Markets and Execution Risk," LSE Financial Markets Group Discussion Paper No. 102, October, and CEPR-ESP Network in Financial Markets Working Paper No. 8, November.
- Pagano, M. and A. Röell (1991), "Trading Volume", in *The New Palgrave Dictionary of Money and Finance*, edited by J. Eatwell, M. Milgate e P. Newman, Macmillan, London, forthcoming.
- Röell, A. (1991), "Dual Capacity Trading and the Quality of the Market," *Journal of Financial Intermediation*.
- Roll, R. (1984), "A Simple Implicit Measure of the Effective Bid-Ask Spread in an Efficient Market," *The Journal of Finance*, Vol. 39, No. 4, 1127-1139.
- Schwarz, G. (1978), "Estimating the Dimension of a Model," *Annals of Statistics*, Vol. 6, 461-464.
- Tauchen, G. E., and M. Pitts (1983), "The Price Variability-Volume Relationship on Speculative Markets," *Econometrica*, Vol. 51, No. 2, March, 485-505.